

WHAT IS CLAIMED IS:

1. A switching power supply unit comprising:
 - a transformer including a primary winding, a secondary winding, and a feedback winding;
 - an input power supply;
 - a first switching element;
 - a control circuit provided between one end of the feedback winding and a control terminal of the first switching element;
 - a rectification circuit connected to the secondary winding; and
 - an output voltage detection circuit for detecting output voltage output from the rectification circuit and for sending a feedback signal to the control circuit; wherein
 - the input power supply and the first switching element are connected in series with the primary winding, and the control circuit includes an on-period control circuit for stabilizing the output voltage by turning off the first switching element in an on-state in accordance with the feedback signal and an off-period control circuit for stabilizing the output voltage by delaying turning on of the first switching element in accordance with the feedback signal.
2. A switching power supply unit according to Claim 1, wherein, in a light-load mode, the output voltage is stabilized by operating the off-period control circuit in order to control the off-period, and in a mode other than the light-load mode, the output voltage is stabilized by operating the on-period control circuit in order to control the on-period.
3. A switching power supply unit according to Claim 2, wherein the feedback signal includes a first feedback signal for controlling the on-period control circuit and a second feedback signal for controlling the off-period control circuit, and the output voltage detection circuit exclusively outputs the first feedback signal or the second feedback signal in accordance with load power.
4. A switching power supply unit according to Claim 3, wherein the output voltage detection circuit includes a first light-emitting diode for outputting the first feedback signal, a shunt regulator connected in series with the first light-emitting diode, and a first series circuit connected in parallel with the first light-emitting diode;

the first series circuit includes a second light-emitting diode and a constant voltage source that is arranged in such a manner that no current flows into the second light-emitting diode until the output voltage exceeds a predetermined value;

the on-period control circuit includes a second switching element provided between the control terminal of the first switching element and a ground at an input side and a time constant circuit connected to a control terminal of the second switching element and functioning to turn on the second switching element;

the time constant circuit includes a second series circuit including a resistor and a first phototransistor that is coupled to the first light-emitting diode; and

the resistance value of the resistor in the second series circuit is such that current flowing into the first phototransistor is hardly changed even when a current greater than or equal to a predetermined value flows into the first light-emitting diode, thereby the time constant of the time constant circuit does not change and the on-period control circuit does not practically operate in order to stabilize the output voltage.

5. A switching power supply unit according to Claim 3, wherein the output voltage detection circuit includes a first light-emitting diode for outputting the first feedback signal, a switch connected in series with the first light-emitting diode, a shunt regulator connected in series with a series circuit including the first light-emitting diode and the switch, and a first series circuit connected in parallel with the series circuit including the first light-emitting diode and the switch;

the first series circuit includes a second light-emitting diode and a constant voltage source that is arranged such that no current flows into the second light-emitting diode until the output voltage exceeds a predetermined value;

the on-period control circuit includes a second switching element provided between the control terminal of the first switching element and a ground at an input side and a time constant circuit connected to a control terminal of the second switching element and functioning to turn on the second switching element; and

the time constant circuit includes a second series circuit including a resistor and a first phototransistor that is coupled to the first light-emitting diode.

6. A switching power supply unit according to Claim 4, wherein the off-period control circuit includes a third switching element connected in series between the one end of the feedback winding and the control terminal of the first switching element, and the third switching element is switched in accordance with the second feedback signal sent from the output voltage detection circuit.

7. A switching power supply unit according to Claim 6, wherein the off-period control circuit includes a second phototransistor coupled to the second light-emitting diode, and the third switching element is switched when the resistance of the second phototransistor is a predetermined value or less.

8. A switching power supply unit according to Claim 7, wherein the second phototransistor functions as part of the time constant circuit in the on-period control circuit by connecting the emitter of the second phototransistor to the control terminal of the second switching element.

9. A switching power supply unit according to Claim 6, wherein the off-period control circuit includes a third series circuit including a capacitor and a second phototransistor that is coupled to the second light-emitting diode, the third series circuit is connected in parallel with the feedback winding in a direction of the current flowing during the off-period of the first switching element, and the third switching element is turned off when the charging voltage of the capacitor due to a voltage generated in the feedback winding is a predetermined value or more.

10. A switching power supply unit according to Claim 7, wherein the off-period control circuit includes a limit circuit for limiting voltage applied to the control terminal of the first switching element, and the limit circuit includes the third switching element.

11. A switching power supply unit according to Claim 1, further comprising:
a DC voltage source for supplying a driving voltage to the off-period control circuit by utilizing voltage generated in the feedback winding; and
a constant voltage regulator provided between the input power supply and the output of the DC voltage source and having a function to prevent backward current.

12. An electronic apparatus comprising the switching power supply unit as set forth in Claim 1.